PENNSYLVANIA
TRAIL OF GEOLOGY

The Rocks, the Glens, and the Falls

RICKETTS GLEN STATE PARK

Ricketts Glen State Park is located on the Allegheny Front, a steep erosional escarpment that marks the boundary between the relatively flat lying rocks of the Allegheny Plateau and the folded rocks of the Valley and Ridge province. The Front and the adjacent "High Plateau" are known by a variety of local names, the most inclusive of which is North Mountain. The park itself is situated on North and Red Rock Mountains. Into the face of this great mountain barrier, Kitchen Creek has carved the picturesque gorge that gives the park its name.

OUTSTANDING PARK FEATURES

Grand View (1)

Grand View (elevation 2,449 feet), the highest point on Red Rock Mountain, is a spectacular scenic overlook affording insight into the geologic setting of the park. To the east and west stretches the imposing wall of the Allegheny Front, here formed by the truncated edges of thick sandstones in the Huntley Mountain Formation (refer to cross section and columnar section). The great relief along the Front—approximately 1,200 feet at Grand View—is the result of a marked difference in erosional resistance between the interbedded sandstones, siltstones, and shales (Catskill Formation and older rocks) that underlie the low, rolling hills immediately to the south and the harder, coarser grained rocks (Huntley Mountain and Pocono Formations) that form the rim of the Front and the Plateau to the north. Cut back into the escarpment for varying distances are numerous valleys and deep ravines, Ricketts Glen being the second embayment to the east. North of Grand View, the Pocono Formation forms a high undulating plateau that extends as far as the eye can see. To the south appear the narrow, even-crested ridges of the Valley and Ridge.

At its maximum extent about 15,000 years ago, the most recent continental glacier covered the entire landscape

Grand View (looking east)

to the north, east, and southeast of Grand View. The margin of the glacier crossed the Allegheny Front about 3 miles west of the park and extended southeastward across the low terrain in front of the escarpment. Because of the southwestward slope of the ice surface, Grand View is believed to have been ice-free and to have projected above the glacier as a nunatak, or "lonely peak."

The white, Pocono conglomerate boulders scattered through the blueberry bushes at Grand View are probably relicts of an older glaciation, one that apparently overrode all of Red Rock Mountain. Evidence of this early glacial event has been completely obliterated elsewhere in the park.

Shale Pit ("The Red Rock") (2)

Red shale and sandstone exposed in the shale pit on Pa. Route 487 occur in the upper part of the Huntley Mountain Formation. It was from this distinctive horizon that Red Rock Mountain obtained its name. Because these beds made a conspicuous band of red across the old Berwick-Elmira Turnpike, nineteenth-century travelers called the locality "The Red Rock." Today, stone from this pit is used for road surfacing and camp-site construction in the park.

"The Red Rock" formed hundreds of millions of years ago from channel and floodplain deposits of ancient streams. A broad (200 feet wide), but shallow (less than 10 feet deep) channel is clearly evident in the pit wall. Diligent search in the rock filling the channel may be rewarded by the finding of burrows of primitive lungfish. These structures, commonly 4 inches in diameter and several feet long, were excavated by individual fish who passed the summer, or dry season, embedded within the soft, damp sands and muds of nearly dry riverbeds. The burrows generally weather out in relief because they are filled with somewhat coarser material than the surrounding sediment.

Lungfish burrows

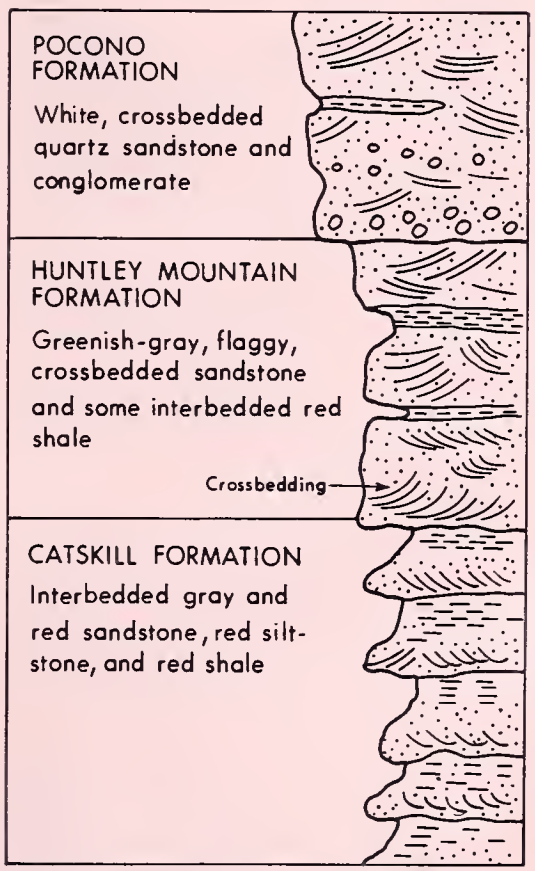
Shale pit ("The Red Rock")

Other noteworthy features of the pit include the gentle northward inclination of rock layering (a characteristic of rocks throughout the park) and the occurrence above the bedrock of reddish-brown stony debris (glacial till) deposited during the last glaciation.

Midway Crevasse (3)

Midway Crevasse is a narrow passageway between large blocks of Pocono sandstone and conglomerate that have been split apart along natural fractures, or joints, by frost wedging and gravity creep. The entire mass of jumbled boulders at this locality is about 225 feet long, 35 feet wide, and up to 15 feet high. It is probable that these blocks were originally part of the high ledge that lies about 100 feet to the north. Under the cold, rigorous climatic

Midway Crevasse



COLUMNAR SECTION SHOWING SEQUENCE OF ROCK FORMATIONS

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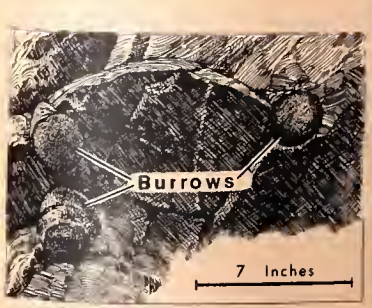

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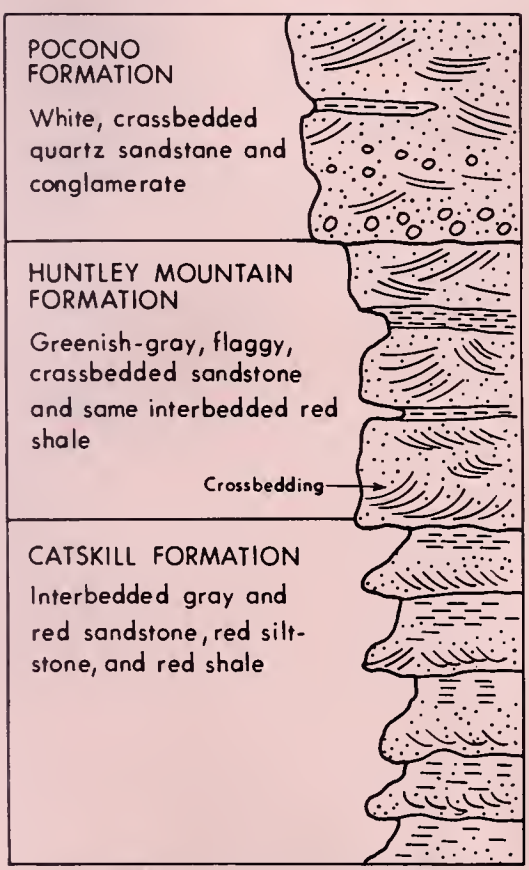
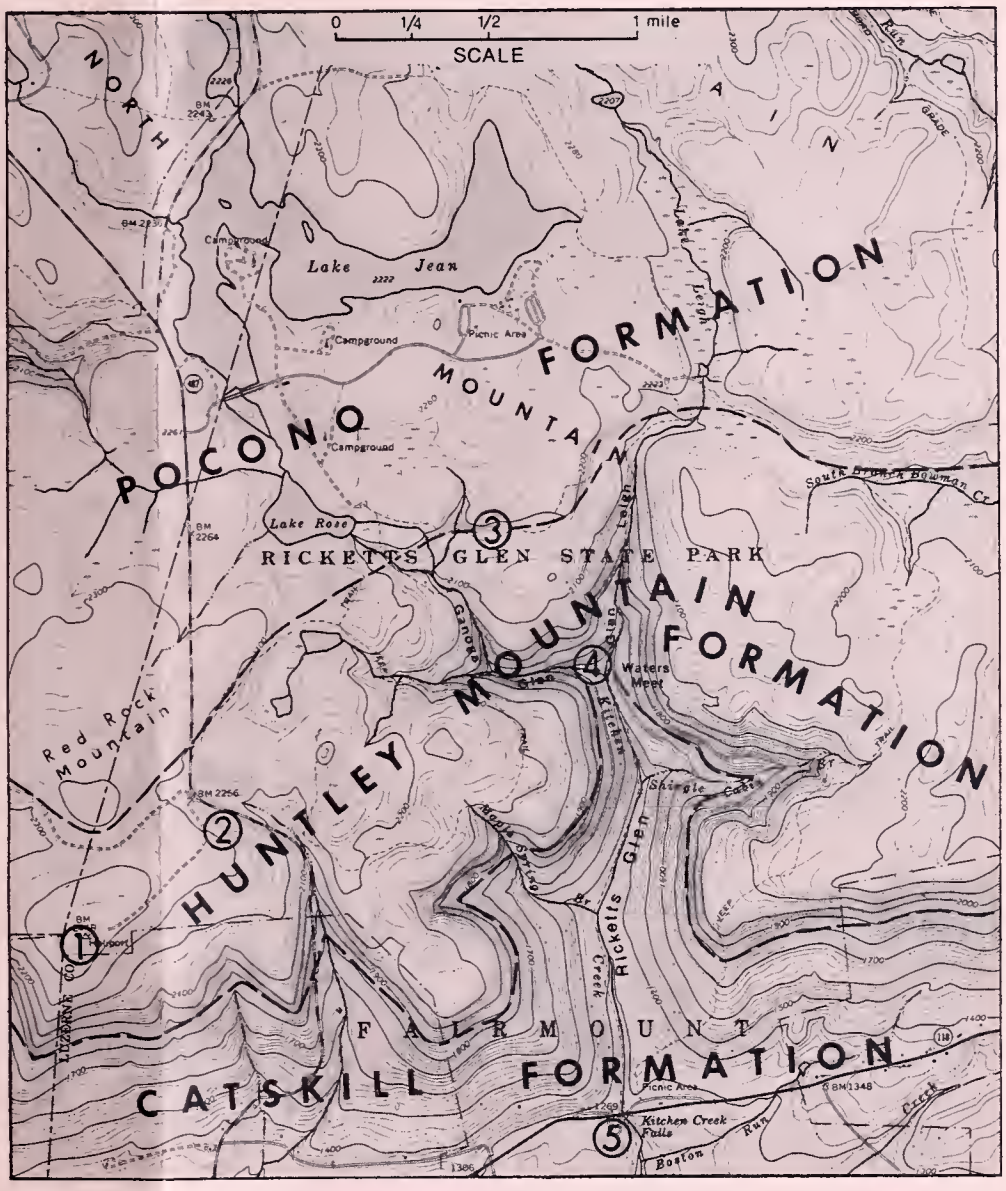
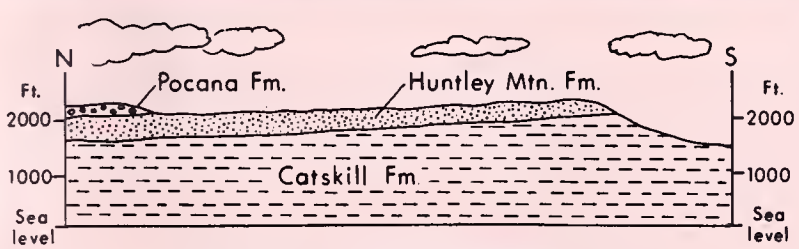
Midway Crevasse



COLUMNAR SECTION SHOWING SEQUENCE OF ROCK FORMATIONS





GENERALIZED CROSS SECTION

The Glens (4)

The Glens is a wild, Y-shaped gorge cut back into the resistant rocks of North Mountain by Kitchen Creek. The elevation drop within the Glens area is approximately 1,000 feet in a distance of 2¼ miles. Most of this drop takes place in Ganoga Glen and Glen Leigh above their junction at Waters Meet.

Although erosion of the Kitchen Creek gorge probably began several million years ago, Ganoga Glen, Glen Leigh, and Ricketts Glen owe their present rugged configurations mainly to the erosive power of glacial meltwaters that rushed down these ravines during retreat of the last ice sheet. The youthful nature of the Glens is shown by the fact that they contain at least 25 distinct waterfalls (22 of them named). These falls range in size from low single cascades such as Oneida Falls (13 feet) to the many-tiered Ganoga Falls (94 feet), highest in the park.

While each falls in the Glens has its own unique beauty, two general types can be recognized. Where the creek descends over thick sandstones in the Huntley Mountain Formation, distinctive "wedding-cake" falls result, as exemplified by F. L. Ricketts Falls. Typical falls in the Catskill Formation, on the other hand, are of the "bridal-veil" type and consist of a relatively hard caprock (usually gray sandstone) overlying a softer layer (red shale) that commonly forms a recess at the base of the falls. An example of this latter type is Harrison Wright Falls.

F. L. Ricketts Falls

Harrison Wright Falls

Adams Falls (5)

Adams (or Kitchen Creek) Falls is the most beautiful falls in the park. Kitchen Creek here plunges over three picturesque cascades (18, 25, and 10 feet high) developed in gray sandstone and red shale and siltstone of the Catskill Formation. Between the individual falls, the stream rushes through deep, narrow gorges that are fluted with numerous potholes. Below the middle and lower falls are large plunge pools eroded by the turbulent water that

descends the falls. The lower plunge pool (Leavenworth Pool) is about 30 feet in diameter and 8 to 10 feet deep.

The potholes at Adams Falls are formed by the grinding action of gravelly sediment that is swirled in tight circular patterns by strong eddies in the stream current. Gradually a smooth circular depression is created where once was only a minor irregularity on the bedrock floor of the stream.

Adams Falls

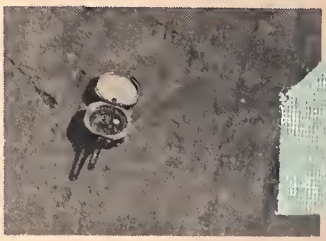
GEOLOGIC HISTORY

The rocks exposed in Ricketts Glen State Park comprise a 1,500-foot sequence of sedimentary rock layers that were originally deposited as unconsolidated gravels, sands, and muds by ancient rivers that flowed across the area about 350 million years ago. The sediments accumulated at relatively low elevations and gradually subsided far below sea level. As more and more material was deposited above, changes in the buried sediments due to increased pressure and the action of underground water resulted in their consolidation into solid rock.

Approximately 250 million years ago, forces within the earth's crust deformed the rocks into tremendous folds in the Valley and Ridge province and into much more gentle folds on the Allegheny Plateau. At this time the rock layers in the park area were tilted at a low angle to the north and elevated in the first and most significant of a series of intermittent uplifts that resulted in raising them to their present position far above sea level. Erosion of the rocks began with the initial uplift and has continued with varying intensity down to recent times. The present landscape has evolved through the erosion of hundreds of feet of overlying rock strata, mainly by running water. Major erosional features, including the Allegheny Front, originated many tens of millions of years ago, whereas minor ones such as the Kitchen Creek gorge originated only a few million years ago.

At least three times in the last million years, continental glaciers buried northeastern Pennsylvania under hundreds of feet of ice. Although evidence for the first two of these glaciations is sparse in the park area, the last left an extensive record as it advanced in a south-southwesterly direction across the Plateau and over the Front about 15,000 years ago. This glacier scoured up loose soil and rock, plucked large blocks of sandstone and conglomerate from outcropping ledges, and abraded grooves and fine striations into the underlying bedrock pavement.

When the ice front retreated to the northeast, a layer of bouldery glacial till was left behind, filling in old valleys and creating lakes and swamps on the flat plateau upland.



Glacial striations

It took several hundred years for the last vestiges of ice to disappear from the top of North Mountain. During this period of glacial retreat, meltwaters poured down the preglacial gorge of Kitchen Creek and produced the remarkable erosive features that we see today.

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Pennsylvania Geological Survey

For further information contact:

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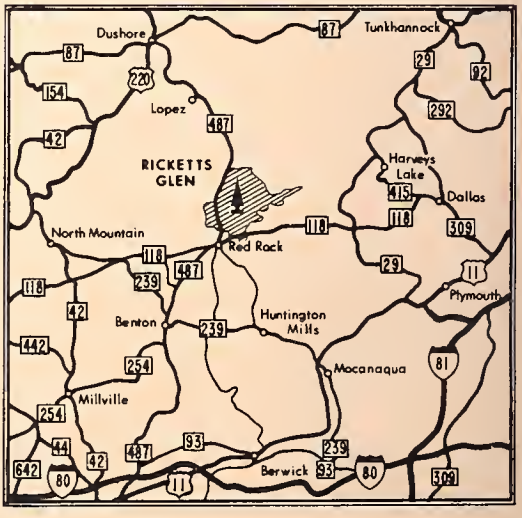

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